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CASE STUDY AS A TOOL OF COMPETENCES FORMATION AND DIAGNOSTICS

Семенов М.Е., Терехина Л.И., Семенов Д.Е.
Национальный исследовательский Томский политехнический университет
E-mail: sme@tpu.ru

The paper proves that case study technology is used for generating and diagnosing competencies. The description of technological case assignment creation is given. An illustrative example for discipline "Mathematics" is shown. To visualize the diagnostic results, the Radar Chart cognitive tool can be proposed.

Key words: case study, online assessment, case assignment, cognitive tool Radar Chart.

In the last decade the online environment as a medium for teaching, learning and assessment is widely used in higher education. The possibilities of modern technologies and e-learning management system (Moodle, Blackboard) allow developers to adapt the content of the resources under the peculiarities of a particular user. Thus, the learning process becomes more individualized. Electronic learning resources include not only viewing video lectures, doing exercises and making tests; they also use modern educational and social technologies.

The aim of the paper is to develop an electronic pedagogical tool on the bases of case study technology for the knowledge diagnosis. To accomplish this aim the following objectives should be achieved: a) to carry out an analysis of case study possibilities for knowledge diagnostics, b) to describe the process of case assignment creation c) to illustrate the proposed approach with examples.

Active educational technology includes case study, project method, game, discussion, moderation, and training. However, only two technologies – case study and project method – can be used to form the individual trajectory of the students' academic activity and monitor its implementation (Lazowski, 2013). The practice of certification exams (e.g., http://act.org, sat.college board.org) has proven the effectiveness of the academic performance rating in the form of computer-based testing. As part of the development of e-learning in the Tomsk Polytechnic University is a transition from the traditional form of written examinations to the innovative way in the form of computer-based testing. According to the curriculum, some modules of

disciplines are taught in English. Therefore, the development of assessment tools in the English language is an urgent task. A variety of types of assignments, including complex ones established in the form of case assignments, can be used as assessment tools for computer-based testing.

We suggest using case assignments for the diagnosis of learning results and fulfilment of individual assignments. To achieve this goal the teacher should allocate 5-10 minutes at the beginning of each lecture to reveal problem areas using computer-aided procedures and, if necessary, to focus additional attention on them. A case assignment is suggested to use as a tool of pedagogical diagnostics. Modern higher education is focused on the formation of competences, which are based on the knowledge and skills enabling the student to logically connect different sections of the course or discipline. The content of case assignments largely determines the possibilities for the formation of students' specific competences, mainly cognitive and activity ones.

Developing a case assignment is a creative process that is difficult to present in the form of an algorithm (O.Reilly, 2005). The main steps of case assignment creation are:

a) to formulate didactic purpose of the case assignment,
b) to find, aggregate, and analyse information,
c) to develop or choose the model of a situation,
d) to create a prototype of case assignment in accordance with the requirements of e-learning management system (structure, content, illustrations, and questions),
e) to conduct testing of case assignment quality (representativity, validity, reliability, and validity),
f) to adjust (if necessary) case assignment,
g) to implement a case assignment as a tool of pedagogical measurement in the educational process.

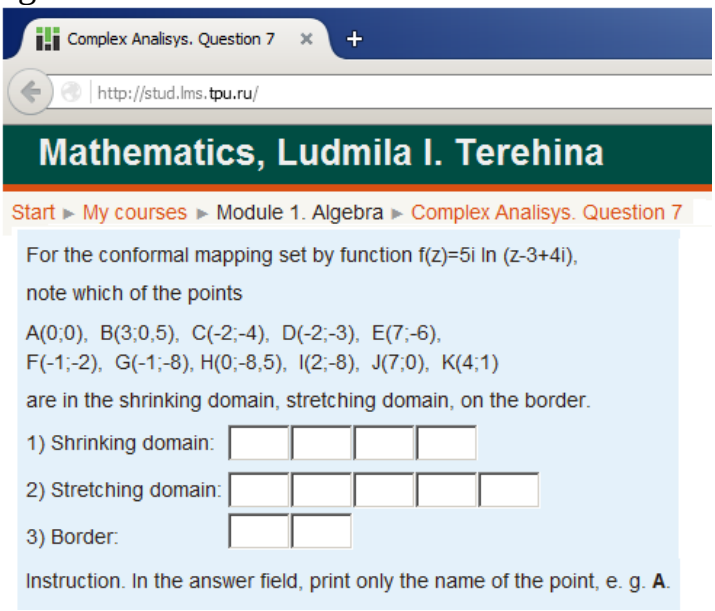
It is worth noting that this process is iterative. After introducing into the educational process the developed and tested case, the assignment must be maintained up to date, the teacher needs to be alert in case the assignment requires a modification (increasing or decreasing the complexity).

The proposed method of diagnostics is implemented in the Moodle e-learning system (http://stud.lms.tpu.ru/). As a didactic unit for the diagnosis "Complex analysis" of the "Mathematics" course has been selected. The case assignment is divided into eight individual tests shown in a predetermined sequence, the transition to the next assignment being made only after the successful completion of the current one. The assignments of the case are differ-

ent forms of test items single or multiple choice, sequencing, matching, short answer, and cloze. Fig. 1-2 shows examples of cloze and matching assignments. This type of assignment males it possible to produce a test assignment in which the questions are embedded directly in the text of the assignment.

Each assignment specifies the number of attempts allowed. If a student has used the maximum available number of attempts, but has not solved the test correctly, the solution of the case is stopped, the final score equals to zero. The number of attempts is taken into account in the calculation of the final grade in the "Assessment report". From this report, one can find out the number of attempts used to solve each assignment.

Fig. 1. Case assignment with the cloze answer



To visualize the diagnostic results, the Radar Chart cognitive tool can be used (Fig. 3). The assignments of the case are marked with letters *A* to *H*, the blue line shows the maximum number of attempts to complete each assignment, the green line shows the number of attempts made by a particular student, the red line shows the average number of attempts for the group of students on each assignment. For interpretation of color Fig. 2, the reader is referred to the online version of this paper. Fig. 2 shows that the student has successfully completed five assignments (*A*-*E*). To perform these assignments an allowable number of attempts have been spent. Assignment *F* (the wording of the assignment is shown in Fig. 2) has not been completed correctly, and the student used the maximum number of attempts – 3. Fig. 2 shows that assignment *D* (the wording of the assignment is shown in Fig. 1) has been completed at the first attempt, which is better than the whole group

on average; assignment *A* has been completed below the average of the whole group. For assignments *C* and *E*, group average characteristics coincide with the performance of the student. According to the results of the diagnostic assessment of knowledge, the student should pay attention to the didactic unit evaluated by assignment *F*.

Fig. 2. Case assignment with the matching answer

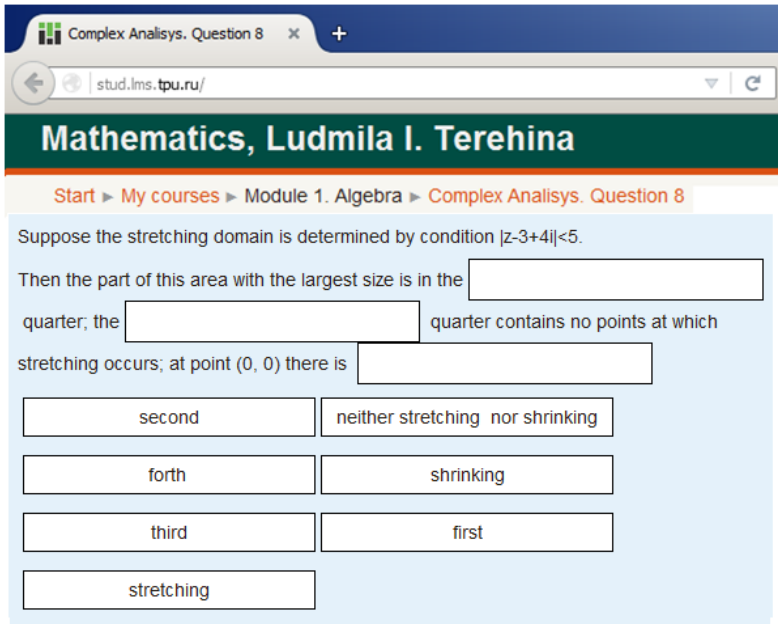
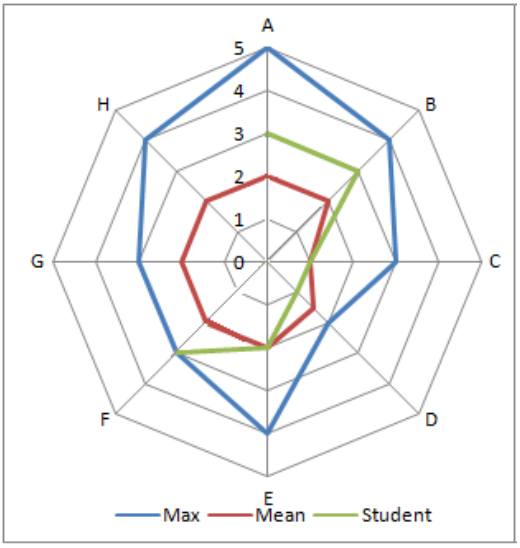


Fig. 3. Cognitive tool Radar Chart



Creating, testing and implementation of case-method into the educational process requires from the teacher creative work which includes research, methodological and technological activity. The Moodle system cannot specify the number of attempts to solve the assignment of an individual case-assignment. Therefore, the original case was divided into eight assignments for each of which the necessary adjustments were carried out.

The use of active teaching techniques allows creating contextual learning conditions for the development of cognitive, activity-related and personal competencies, as well as stimulating intellectual, personal and social activity and student motivation.

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